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not contain any partial illumination, expressly so in the account of Sir John Herschel and Mr. Breen, and impliedly so in that of Mr. Dawes.

I have also referred to a description of the Solar Eclipse of 1836 by Admiral Smyth,* from which it would also appear that no partial illumination was then seen on the Moon, and although it is remarked that at first the lunar limb was somewhat tremulous, it yet soon became steady and *the definition pre-eminently fine.*

The suggestion cautiously thrown out by Mr. Stuart as to whether this lunar illumination resulted from the frangibility of a lunar atmosphere was *per se* a very natural one, but when considered in connexion with contemporary observations it cannot be deemed valid. The united testimony on that occasion of Sir John Herschel and Messrs. Dawes and Breen under such favourable circumstances has set at rest the question of any visible refrangibility, and, therefore, the rationale of the illumination of the lunar surface must be sought for in some other cause.

The next step was to learn what other Astronomers had noticed during the last solar eclipse. Sir John Herschel very obligingly replied to my questions, and I have his permission to state that he did not see any particular light on the Moon and that it seemed to be uniformly and absolutely black, and that certainly the Moon looked darker than the solar spots, *i.e.* their *average* illumination for the low magnifier used did not allow a sight of the nuclei.

The case, therefore, seems to stand thus:—When the definition is really good no such particular illumination of the Moon's disk seems to have been remarked; but when the definition is bad, and the Moon's edge boiling, then a greater or less amount of such illumination seems to have been observable.

Would not the inference consequently be that this apparition must rather be the result of the conditions of the atmospheric medium through which the celestial bodies were viewed than connected with the bodies themselves? Or does it not arise from "one of those strictly ocular nervous phenomena not properly subjective, but sensational," alluded to by the Astronomer Royal in his very valuable paper on the lunar luminous band?†

*Ensleigh Observatory, Lansdowne, near Bath,*
*31st December*, 1870.

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## *Note on Oudemann's Theory of the Coronal Radiations.*
### By Richard A. Proctor, B.A. (Cambridge).

The papers read at the last meeting on the subject of the recent eclipse were so full of interest that it seemed desirable not

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* *Celestial Cycle*, vol. i. pp. 140–2.

† *Monthly Notices*, vol. xxiv. p. 18.

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to prolong a discussion which was raised respecting Oudemann's theory of the coronal beams. But as some of the results which the eclipse observers obtained would appear to be invalidated if certain points of Oudemann's theory were admitted, I venture briefly to note two objections of which the second at least seems decisive against those points.

Admitting with Oudemann the probability that the interplanetary spaces are occupied to distances from the Sun far exceeding the radius of the Earth's orbit, by matter capable of reflecting a certain proportion of light, it yet appears improbable that the whole quantity of such matter within a distance from the Earth equal to the radius of the Moon's orbit could reflect an appreciable quantity of light. It seems exceedingly unlikely that under such circumstances the sky towards the meridian at night would remain to all appearance dark, while yet, according to Oudemann's view, the sky towards the Moon's place during total eclipse would be appreciably illuminated. It is undoubtedly true, as pointed out by Professor Adams, that some substances (black cloth or velvet for instance) are rendered visible by rays falling obliquely, whereas rays falling square to their surface are absorbed. But certainly all the forms of non-luminous matter which we *know of* as tenanting the interplanetary spaces, would be better seen when placed as planets are when in opposition than as planets are when near inferior conjunction. I need not point out why this is, or that it is not so much a question of the reflective capacity of the particles themselves, as of the proportion of their illuminated surface which is turned towards the Earth. Certainly a group of minute meteors near the Moon's place when she is full would send us much more light than the same group near the Moon's place when she is new.

But, quite apart from this, there is an argument which appears to me to render Oudemann's reasoning altogether inadmissible. Assuming that the quantity of illuminated matter lying on *this* side of the Moon during total eclipse would *by itself* be appreciable, yet the much greater depth of the same matter lying beyond the Moon (and as well placed for the oblique illumination required) would be enormously greater, and would also be illuminated far more brightly. If a depth of 250,000 miles, full of such matter as Oudemann's theory requires, could give a certain quantity *a* of light, ten millions of miles next beyond and towards the same direction would undoubtedly give more than the quantity 40 *a* of light, and the remaining 80 millions of miles lying yet further beyond, towards the neighbourhood of the Sun himself, would give a quantity of light which would even render this last-named quantity wholly inappreciable.

It is to be remembered that Oudemann's theory, or rather that special part of it which relates to the coronal beams, was urged to explain the supposed mobility of the beams, as seen by Dr. Gould; and that all the other American observers in 1869 considered that the beams were stationary. And further, it should be

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noticed that a single observation of the fixity of coronal rays (as, for instance, Bruhn's observation in 1860) is more convincing than any number of observations of apparent motion. For, seen as the beams must needs be (if beyond our atmosphere) through a medium whose condition is probably very variable during a total eclipse, we can readily understand that their aspect should sometimes seem to vary, or even that they should appear and disappear under the observer's eyes. But the fixity of a coronal beam cannot so be explained away; and those who are familiar with the history of eclipse observations are aware that many of the positive observations of this sort are often unexceptionable.

Now the great V-shaped gap in the corona last December was visible at widely separated stations; it is clearly recognisable in a photograph taken by the American observers in Spain; and it remained unchanged during the whole of totality.* A positive observation like this, relating to an object extending to a great distance (nearly half a degree) from the Moon's limb seems altogether unmistakable in its import. When it is added that the bright inner corona was perceptibly depressed where this V-shaped gap existed, results of very great interest are suggested.

Do not the observations made last December strongly support the view urged a year ago by many (myself among the number) that the corona is a solar aurora? *If the action of the radial solar forces which generate this aurora be supposed only to be more energetic over the spot-zone, and specially over the regions where spots actually exist, we should not only have an explanation of the so often noticed trapezoidal form of the corona, but also a suggested explanation of the observed association between the Sun-spot period and terrestrial auroras.*

## *On the Nomenclature of Matter exterior to the Sun's Globe.*

By Richard A. Proctor, B.A. (Cambridge).

I venture, while there is yet time, to urge the adoption of convenient and expressive names for the phenomena presented during solar eclipses.

The word *photosphere* serves a very useful purpose, and I do not know that any other could be devised which would be nearly so suitable. But to the names *chromosphere* and *leucosphere* there are grave objections.

In the first place, the relation between the prominences and the layer of coloured matter at a lower level is such as to render the

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* Since this was written I have had the opportunity of examining the best of Mr. Brothers' photographs (taken at Syracuse). This view, No. 5 of his series, far surpassing all other pictures of the corona in interest and value, shows the V-shaped gap opposite the south-eastern quadrant in an unmistakable manner. Indeed the gap is the most striking feature in the photograph. This disposes of the question.